Statistique mathématique I

Lecturer
Davy PAINDAVEINE (Coordinator)

Course mnemonic
MATH-F207

ECTS credits
5 credits

Language(s) of instruction
French

Course period
First term

Campuses
Solbosch and Plaine

Course content

Introduction to statistical inference:

- Sampling theory (sample vs population, statistics, sampling distributions, Fisher's lemma)
- Point estimation (the problem, estimation criteria, estimation methods)
- Hypothesis testing (basic concepts, Neyman-Pearson, monotone likelihood ratio families, likelihood ratio tests, chi-square tests)
- Confidence intervals (basic concepts, pivotal functions, exact and asymptotic intervals, duality with hypothesis testing).

Objectives (and/or specific learning outcomes)

With the help of this course unit, students will be able to:

- make use of the basic principles of statistical inference
- build, for an arbitrary parametric model and for each of the classical inference problems (point estimation, hypothesis testing, interval estimation), suitable inference methods
- appreciate how simulation results can help validating a statistical theory

Pre-requisits and co-requisits

Pre-requisites courses

MATH-F105 | Probabilités I | 5 crédits

Course having this one as pre-requisit

STAT-S308 | Introduction à l'économétrie | 5 crédits

Course having this one as co-requisit

MATH-F309 | Statistique mathématique II | 5 crédits

Teaching method and learning activities

Lectures (theory)

Exercise sessions

Contribution to the teaching profile

- Analyzing, summarizing and making links between the various fields in mathematics
- Mastering the principles of logical reasoning and being able to base on these a solid argumentation
- Identifying the mathematic framework underlying a given problem
- Becoming familiar with methods of modelling.
- Understanding criteria of rigour, argumention, techniques of proofs
- Understanding how concepts emerge from observations or examples
- Understanding data analysis and modelling
- Identifying questions arising in a theory
- Exploring the consequences of a mathematical result

References, bibliography and recommended reading

Bickel, P.J., et Doksum, K.A. (2001). Mathematical Statistics. Basic Ideas and Selected Topics. Prentice Hall, New Jersey.

DasGupta, Anirban (2008). Asymptotic Theory of Statistics and Probability. Springer, New York.

Knight, K. (1999). Mathematical Statistics. Chapman & Hall/CRC.

Shao, J. (2003). Mathematical Statistics. Springer-Verlag, New York.

Course notes

Syllabus and Université virtuelle

Other information

Place(s) of teaching

Plaine and Solbosch

Contact(s)

Davy Paindaveine

<Davy.Paindaveine@ulb.be>

Evaluation method(s)

written examination and Oral examination

Evaluation method(s) (additional information)

A written exam will be organized in January. The exam will offer both open questions and closed questions (MCQ and/or true-or-false). Questions may refer to the theory (for bachelor students: this includes proofs) and exercises.

Students who will obtain a grade larger than or equal to 8/20 in the written exam will be given the opportunity to take an oral exam, that will be organized in January, too. The oral exam is not compulsory (as it may result in a final grade that is lower than the one obtained in the written exam). If one does not take the oral exam, then the final grade will of course be the one obtained at the written exam.

In the "seconde session", a written and an oral exam will be organized in August/september, according to the same rules as in the "première session".

Determination of the mark (including the weighting of partial marks)

The final grade is unique and cannot be considered in parts.

Main language(s) of evaluation

French

Programmes

Programmes proposing this course at the faculty of Sciences

BA-MATH | Bachelor in Mathematics | unit 2